



***Supplement for HE500GIU5xx
Orion-Series Graphical Interface Unit***

**GENIUS OPTION CARD
DEVICE DRIVER**

**Preliminary Supplement
April 16, 1998**

I. INTRODUCTION

If the Genius Option Card is installed, the Genius device driver allows the HE500GIU500 to act as both a GENIUS slave or a limited functionality GENIUS master. As a slave, the driver can broadcast global data and received directed control messages from the master. Additionally, the driver can access PLC registers (via an attached associated bus controller) through Genius datagrams. As a master, the driver can send directed control information and receive global data from remote slaves. However, slave fault message processing is minimal with those messages being sent to the GIU Fault log.

Version 1.0.73 or later of the Horner APG Orion Series GIU Project Editor is required to configure the Genius driver on the HE500GIU500. Furthermore, Version 1.0.54 of the GIU Executor (EXEC) is required to support the Genius Option Card.

II. INSTALLATION

If the HE500GIU500 contains the Genius Option Card, connections will be made at the Genius 4-pin communications port next to Com1 (Slot0). Currently, only slot 0 on the GIU supports the Genius Option Card. The diagram on the back cover illustrates the pin connections to the port.

GENIUS [Optional]			
Serial 1	Serial 2	Shield In	Shield Out

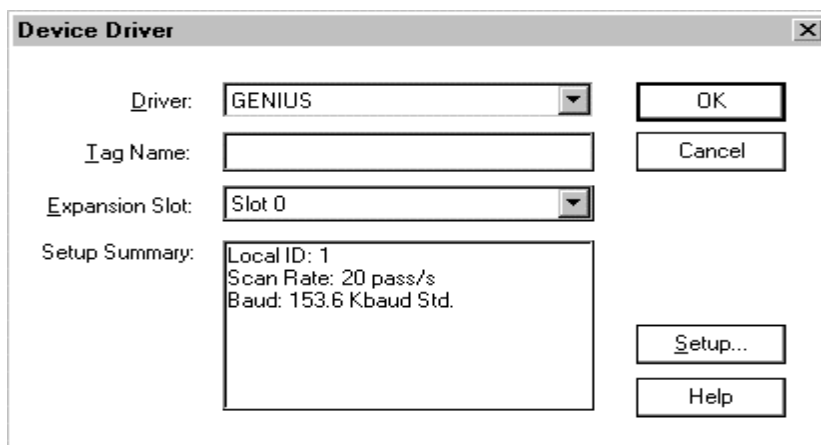
Each Genius device has four terminals for the serial bus cable (Serial 1, Serial 2, Shield In, and Shield Out). Connect the Serial 1 terminal of each block to the Serial 1 terminals of the previous device and the next device. Connect the Serial 2 terminal of each block to the Serial 2 terminals of the previous device and the next device.

Shield In of each block must be connected to Shield Out of the preceding device. For the first device on the bus, Shield In can be left unconnected. For the last device on the bus, Shield Out can be left unconnected.

For more information on cabling, terminators, and baud rate considerations, refer to GE Fanuc GEK-90486F-1 Genius I/O System and Communications User Manual.

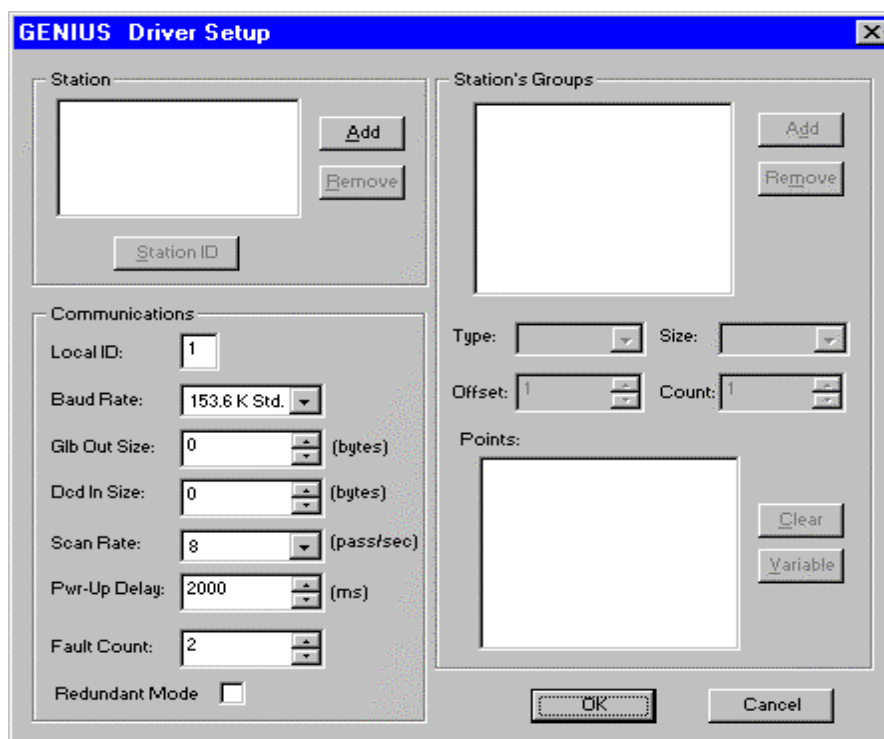
III. SETUP

From the Orion editor, invoke the **Project | Device Driver | Add** menu:



- Select GENIUS from the **Driver** list.
- Create a unique **Tag Name** for the network in the corresponding field.
This name will be used to uniquely identify this instance of the GENIUS driver for error messages and Get/SetDriverProperty instructions.
- Select the appropriate internal **Expansion Slot** that contains the Genius Option Card in the GIU.
Currently, only slot 0 is supported.

The Setup Summary provides a quick view of the Genius network configuration parameters. To change the network configuration parameters or create I/O groups and variable associations, click the **Setup** button to display the following.



Communications

This section's entries set the Genius communication parameters of this station. Note that these parameter must match or be compatible with the settings of other stations on the same network.

- Select the GIU's Genius node id in the **Local ID** field.
This selects the id which will identify the GIU to the other Genius nodes. This node number must be unique on the network. If the GIU is sending global output data, the receiving PLC (via a bus controller must contain a configuration for this id. That configuration must identify this device as **GENERIC**.
- Select the Genius **Baud Rate** of the network.
- Select the **Global Output** size.
Generally, this field is only configured if the GIU acts as a controlled slave. This specifies the size of global data that the GIU transmits on the Genius bus. Receiving bus controllers must be configured to receive this amount of data or a configuration mismatch fault may be generated. Note that group(s) must be created to actually write to this data.
- Select the **Directed Control Data Input** size.
Generally, this field is only configured if the GIU acts as a controlled slave. This specifies the size of the direct control data that is expected by the GIU from the controlling master. The controlling master must be configured not to exceed this size or a configuration mismatch fault may be generated. Note that group(s) must be created to actually read this data.
- Select the **Scan Rate**.
This file specifies the maximum number of datagrams which can be generated per second. This allows the user to limit GIU access to the Genius bus to prevent loading. This is a maximum limitation only, other factors such a bus speed, bus controller response time and number of global (in/out) groups may reduce the actual number of datagrams per second.
- Select the **Pwr-Up Delay**.
This allows the user to delay station off-line fault indications at power-up because of a device which is slow to go active after a power-cycle. This does not effect the 1 second delay before datagrams are sent once the device indicates active on the network.
- Select the **Fault Count**.
This specifies the number of consecutive read or write failures which must occur before a OFF-SCAN fault is generated. While this parameter can be increased to prevent GIU fault generation on Genius buses with error counts under normal operation, steps should be taken to keep Genius bus errors at minimum.
- Check/Uncheck **Redunancy**.
If the GIU is acting as a slave or requesting Datagrams from a master at address 31, and that master goes off-line, the GIU will instead request/expect data from address 30. This should only be checked if the system contains redundant masters.

Station

This list specifies the remote stations to be accessed for data transfer with the GIU. A "station" refers to a specific device attached to the Genius network. In a Genius network, each station must have a unique ID assigned to it. These ID's will range from 0 to 31 with the bus controller usually assigned ID 31 and ID 0 is usually reserved for the hand-held programmer.

- Adding Stations:
In the Station Box, select **Add** to create an entry for a new station. The Add button will automatically select a new value for the id and that id will be added to the list. To change that id value, select the added Id, click on the "Station Id" button, and enter a new id value.

- Removing Stations

A configured station (and all associated groups) can be removed by selecting the station Id in the Station box and clicking **Remove**.

Once a station is defined, the remote I/O points to be retrieved from that station must also be defined. This is done by selecting a station Id by clicking on it in the station list and moving to the Station Groups box.

Station Groups

To access or send data to the master or a remote station, a group(s) must be configured for that station Id. During an I/O scan, the GIU will read group configurations and either create datagram messages or access global or directed data. For datagram accesses, the driver must be configured with the I/O register table, offset, and number of points to access in the target PLC. Additionally, the user can access the PLC analog registers as signed or unsigned 16 bit values or 2 consecutive PLC analog registers as signed 32 bit value with a fourth "size" parameter. For global or directed control accesses, the driver must be configured with offsets of each data item which matches that of the offsets specified in the masters configuration.

1. Defining a group for Datagram access from a master

Datagram groups should only be configured for Series 90 PLCs or devices supporting the Read and Write Device Genius sub-function codes. The station Id currently selected for the group must be the Genius address of this Series 90 PLC or device. The actual Series 90 address is configured for the Genius Bus Controller (BEM) associated with the PLC.

Because each datagram transaction consumes time, the user should layout register usage on the PLC such that the points can be packed into a minimum number of datagrams (groups). Response time for datagrams depend on three factors: low priority datagram access to the bus, transfer time on the bus and the Bus Controllers response time to the datagram request (2.5 to 5.0 times the PLC scan time). All groups are scanned in sequence with the scan halted until a response to the last datagram is received or a timeout event occurs. Since the response timeout is set to 2.8 sec, the group scan rate will be slowed significantly on buses with high error rates.

- From the Station's Groups box, select **Add** to create a new group entry.
The editor will automatically create a default %R group type, offset and length. The user will usually modify these values as described below.
- From the **Type** entry, select the type of PLC register being accessed.
The list includes the basic data types of a GE-Fanuc PLC.
- If the Type is analog (i.e. %AI, %AQ, %R,...) , the **Size** specifies the size of the PLC data.
Series 90 PLCs allow different data types and contiguous registers to contain a single data item. The select-able entries are: Int16 (signed 16 bit value), Uint16 (unsigned 16 bit value) and Int32 (signed 32 bit value). When selecting Int32, the Genius Driver will access two consecutive PLC registers to fill the value. When using Int32 size, it is only necessary to assign a variable to every other PLC register.
- From the **Offset** entry, select the starting PLC register in the group.
Acceptable values are determined by the model of the remote PLC. The first register is always offset 1.

- From the **Count** entry, select the number of PLC registers to be returned.
Acceptable values are determined both by the model of the remote PLC and the maximum size of a datagram. The maximum datagram size limitation is 64 analog registers or 1024 binary registers. However, there is also a total point limitation of all the combined groups of 1024 points.

2. Defining a Slave group

The driver may be configured such that the HE500GIU500 appears as a slave device on the Genius bus and as such can generate output data and/or receive control data from a master device (i.e. PLC).

A slave device broadcasts the output data but requires directly addressed input data. Multi-masters can all receive the slave's broadcasted data; however, only one master can send directed control data to a slave. The amount of both output or input data is configurable for the driver but is limited to a maximum of 128 bytes. Since this data is transferred on each Genius bus token pass, data transfer using this method can be significantly faster than datagrams.

When the driver is configured as a slave, a controlling master (PLC) must be configured to match the amount of the slave's global data transmitted and the amount of control data a slave expects. The driver sets these sizes from the Glb Out size and Dcd In size parameters in the communications section. The controlling master's generally sets these sizes in the Genius Bus Controller (BEM) I/O configuration on the PLC. The controlling master's BEM I/O configuration generally includes the following parameters:

Slave Device Data Section:

Slave Address (SBA):	Address of GIU
Slave Type:	Generic
Slave Input Type/Offset	PLC register location receiving data from slave
Slave Input Length	Number of data items to receive. Do not exceed the size specified by Glb Out Size .
Slave Output Type/Offset	(PLC register location sending data to slave)
Slave Output Length	Number of data items to send. Do not exceed the size specified by Dcd In Size .

While the communications parameters Glb Out Size and Dcd In Size set the size of the output data and input data respectively, the groups define the offsets in those data areas that are associated to GIU variables.

The station Id currently selected for the group must match the local Id (Communications section) indication the address of GIU.

- From the Station's Groups box, select **Add** to create a new group entry.
The editor will automatically create a default GOB group type, offset and length. The user will usually modify these values as described below.

- From the **Type** entry, select the data table being accessed (**Global Out (B/W)** or **Directed In (B/W)**).
Both the (Global) Output data and the (Directed Control Data) Input data can be thought of as a table of bytes. The master device may access these bytes as either **Bit** packed (discrete) data or **Word** (analog) data or a combination of both. Likewise, the Group configuration allows access to these data tables as bits or words.

 GOB - Global Output table, bit-packed access (offset/count refer to bits)
 GOW - Global Output table, word access (offset/count refer to words [2 bytes])
 DIB - Directed Input table, bit-packed access (offset/count refer to bits)
 DIW - Directed Input table, word access (offset/count refer to words [2 bytes])
- Size** entry for these groups is not enabled.
- From the **Offset** entry, select the starting offset (bit or word) from the selected data table.
Note that the first data item is offset 1.
- From the **Count** entry, select the number of points (bit or word) from the selected data table.
The Orion editor will prevent offset or count exceeding the configured table sizes specified with the Glb Out and Dcd In Size parameters.

3. Defining a Master group

The GIU can act as a limited function Genius master and can access a slave's Global or Directed data. However, no facilities are provide to generate optional configuration or control datagrams. Additionally, slave fault messages will be logged to the GIU fault log; however, no provisions are provided for sending a Genius Clear_All_Faults message.

The station Id currently selected for the group must match the Id of the slave device for which the data is directed.

- From the Station's Groups box, select **Add** to create a new group entry.
The editor will automatically create a default %R group type, offset and length. The user will usually modify these values as described below.
- From the **Type** entry, select the data table being accessed (**Global In (B/W)** or **Directed Out (B/W)**) and the type of data access.
Both the (Slave Global) Input data and the (Slave Directed Control Data) Output data can be thought of as a table of bytes. The slave device may allow access these bytes as either **Bit** packed (discrete) data or **Word** (analog) data or a combination of both. Likewise, the Group configuration allows access to these data tables as bits or words.

 GIB - Global Input table, bit-packed access (offset/count refer to bits)
 GIW - Global Input table, word access (offset/count refer to words [2 bytes])
 DOB - Directed Output table, bit-packed access (offset/count refer to bits)
 DOW - Directed Output table, word access (offset/count refer to words [2 bytes])
- Size** entry for these groups is not enabled.
- From the **Offset** entry, select the starting offset (bit or word) from the selected data table.
Note that the first data item is offset 1.
- From the **Count** entry, select the number of points (bit or word) from the selected data table.

Do not exceed the slave's specified (or configured) Directed Control Data input size or a fault will be generated.

4. Associating GIU variables to group points

Once the group parameters are completed, an indication of each point in the group will appear in the **Points** list. To access a point value returned in a group (datagram or global/directed data), it must be associated GIU declared variable. To associate a variable, select the specific data point in the Points list. The following screen will be displayed.

- From the **Variable Name** field enter the GIU variable name to be associated with the point. You can either enter the variable name by typing it or the ▾ button drops an easy to select selection box of the currently defined variables. The >> button is shortcut to the Project | Variables... definition dialog which allows you to immediately define a new variable.
- From the check boxes, select the attributes of the association.

Read

The associated GIU variable will be written with any changes to the data point by the remote Genius device.

Write

Any change to the associate GIU variable will be written to the remote Genius device. Actual writes to the remote I/O point will only occur when the value changes. Furthermore, changing a single I/O point in a defined group and will not effect any other points defined in that group.

Suppress initial write if zero

If this attribute is checked (and assuming Read and Write are also checked), at GIU power-up, the remote I/O point will not be over-written if the associated GIU variable has **not** been initialized in the Initial Script. This will allow the associated GIU variable to assume the value of the remote I/O at GIU power-up. Thereafter, any changes to the associated GIU variable will be reflected at the remote I/O point.

If this attribute is not checked and Write is enabled, the remote I/O point will be initialized regardless of the value of the associated GIU variable at GIU power-up.

Unscale on Write

If the scaling feature is enabled, this feature is used in special applications not covered by this document. For all other applications, keep this checked.

A GUI variable may be associated with two remote I/O points only if one associations is Read only and the other is Write only. This allows data to be passed from one devices remote I/O point to another devices remote I/O point. Any other attempt to associate a GUI variable with multiple I/O points will generate an error.

Scaling Enabled

If this attribute is checked, the **Scaling Slope** and **Scaling Offset** values will be used to scale the remote I/O data value to an engineering value before it is loaded to the associated GUI variable as follows:

$$\text{Variable} = (\text{Scaling Slope} * \text{remote I/O value}) + \text{Scaling Offset}$$

If Unscale on Write is selected, the corresponding expression will be applied on write:

$$\text{Remote I/O value} = (\text{Variable} - \text{Scale Offset}) / \text{Scale Slope}$$

Note that floating point calculations on the GIU have a limited resolution such that a scaled value written to a remote I/O point may not be reflected back as the same exact value.

IV. ACCESSIBLE DRIVER PROPERTIES

The following properties (Uint 32 variables) are available to the user program using the GIU Basic command **GetDriverProperty**.

ScanTime

This returns the number of milliseconds it takes to update all the currently active groups.

BusTime

This returns the number of milliseconds it takes to complete a Genius bus cycle.

BusActive

This returns a 32 bit representation of the Genius stations on-line. The lsb represents station 0.

BusFault

This returns a 32 bit representation of the Genius stations with corresponding groups which are currently unable to communicate because of a communications fault. The lsb represents station 0.

BusErrors

This returns the number of Genius bus errors since the GIU powered up. The maximum count is limited to 65535.

V. FAULTS

The Genius driver will generate three classes of fault information which is logged in the GIU fault log. The first class of is that of an unrecoverable driver (FATAL) fault. This type of fault is attributed to a hardware or firmware failure and can only be reset by recycling the power to the HEGIU. The second class is that of allowing partial operation (NON-FATAL). This type of fault generally attributed to lack or response to a group request from the remote Genius station. These faults can generally be corrected by taking the remote station off-line, correcting the configuration or physical network problems and reconnecting the remote station. The last class is that of information or detection of fault corrections. This informs the user when a fault is corrected.

The Genius driver will generate faults for the following conditions. These faults may be displayed from the GIU **System Shell | View Log** menu.

Fatal Faults:

FATAL: Slot #(x) unavailable <or> used or opened by other device.

Invalid slot number or attempt to open multiple drivers on same slot.

FATAL: Card not detected in slot #(x)

Specified wrong slot number or card is not present or defective.

FATAL: Unable to access network, check Id/baudrate

Genius Option card is unable to log-on to network. May have duplicated Id or configured with invalid baudrate.

FATAL: Hardware fault - #(x)

The uGeni Option Card detected an internal fault. The specific fault is indicated by the number or message returned in #(x). [Contact Tech Support]

FATAL: Software fault - #(x)

The Genius driver detected an unexpected state of the uGeni Option Card. The specific fault is indicated by the number returned in #(x). [Contact Tech Support]

Non-Fatal Faults:

Id: #(x), OFFLINE: Loss of Device

The uGeni Option Card is not detecting remote Genius station #(x) as present on the bus. Groups belonging to station will not be included in group scan until remote station logs-on. No fault is generated if remote station was controller and redundancy backup was activated (requires redundancy enabled in configuration).

Id:0031/0030, OFFLINE: Main & Redundancy Device

Both the bus controller and redundancy backup device is no longer active on network (requires redundancy enabled in configuration).

Id: #(x), Grp: #(y) - OFFSCAN: Excessive response errors

The remote Genius station #(x) has not responded to a Group #(y) datagram consecutively for the specified Fault count. This may be an indicator of a high number of bus errors <or> the specified group has an offset plus count that exceeds the specified reference table on the remote Genius station (PLC will not respond to datagram with invalid parameters). That group will be removed from the group scan list until the associated remote station is logged off and then back on.

Id: #(x), Grp: #(y) - OFFSCAN: Exceeds remote directed in size (DOB/DOW)

Group #(y) under remote Genius Station #(x) specified an offset plus count that exceeds the configured/specified size of the directed input expected by the remote Genius station. (Refer to remote Genius station data input size specification or configuration). That group will be removed from the group scan list until the associated remote station is logged off and then back on.

Id: #(x), Grp: #(y) - OFFSCAN: Exceeds remote global out size (GIB/GIW)

Group #(y) under remote Genius Station #(x) specified an offset plus count that exceeds the configured/specified size of the global output data transmitted by the remote Genius station. (Refer to remote Genius station data output size specification or configuration). That group will be removed from the group scan list until the associated remote station is logged off and then back on.

*Informative:***Id: #(x), ONLINE: Addn of Device**

The uGeni interface board has just detected configured remote Genius station #(x) logging on to the network. This is only generated if a previous "OFFLINE - Loss of Device" was generated for that remote Genius station.